Quantum Engineering Design, Inc.

IMPROVED CONTAINER LIFTING FRAME (ICLF)

IMPROVED CONTAINER LIFTING FRAME - MARK II (ICLF-Mk II)

OBJECTIVES OF ICLF PROTOTYPE PROGRAM - (1995

- **Design and develop modifications to a standard ISO container lifting frame to improve its handling in elevated sea-state conditions.**
- **Fabricate and demonstrate a full scale prototype of the concept.**

OBJECTIVES OF ICLF - Mk II DEVELOPMENT - (2004

- **Using ‘Lessons Learned’ from previous program, design and develop an improved version of the ICLF (designated ICLF Mk II).**
- **Fabricate and demonstrate a full scale prototype of the concept.**

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DESIGN CRITERIA FOR ICLF PROTOTYPE

1. The improved lifting frame system must be directly compatible with existing LOTS ISO container transfer assets including shipboard (i.e. T-ACS) cranes, power supplies fixtures and fittings.

2. The improved system should be based upon modifying existing assets, specifically the manually operated and locking lifting frames in current U.S. Army inventory capable of handling 20-ft, 35-ft and 40-ft containers (i.e. conforming to MIL-S-52713A(ME) specification). The improved system should be common to all sizes of lifting frame with only simple modifications of the hardware.

3. The modifications to the current lifting frames should not compromise the structural integrity of the units and should be designed as a bolted, add-on system to the current frames.

4. The modifications should not require any modifications to the T-ACS crane units and should make use of existing crane power supplies and control systems.

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5. The modified system should utilize off-the-shelf components and common hardware items. Components should be fabricated from stainless steel and aluminum as appropriate and/or galvanized or painted steel.

6. The improved system should minimize hazards to personnel while maximizing container transfer throughput rate.

7. The improved system should be simple to operate and maintain and be capable of being removed and replaced onboard ship with conventional hand tools.

8. The improved system should be capable of being stored onboard the T-ACS in the same manner as the current unmodified units.

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Improved Lifting Frame Component

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ICLF ANIMATION SEQUEN

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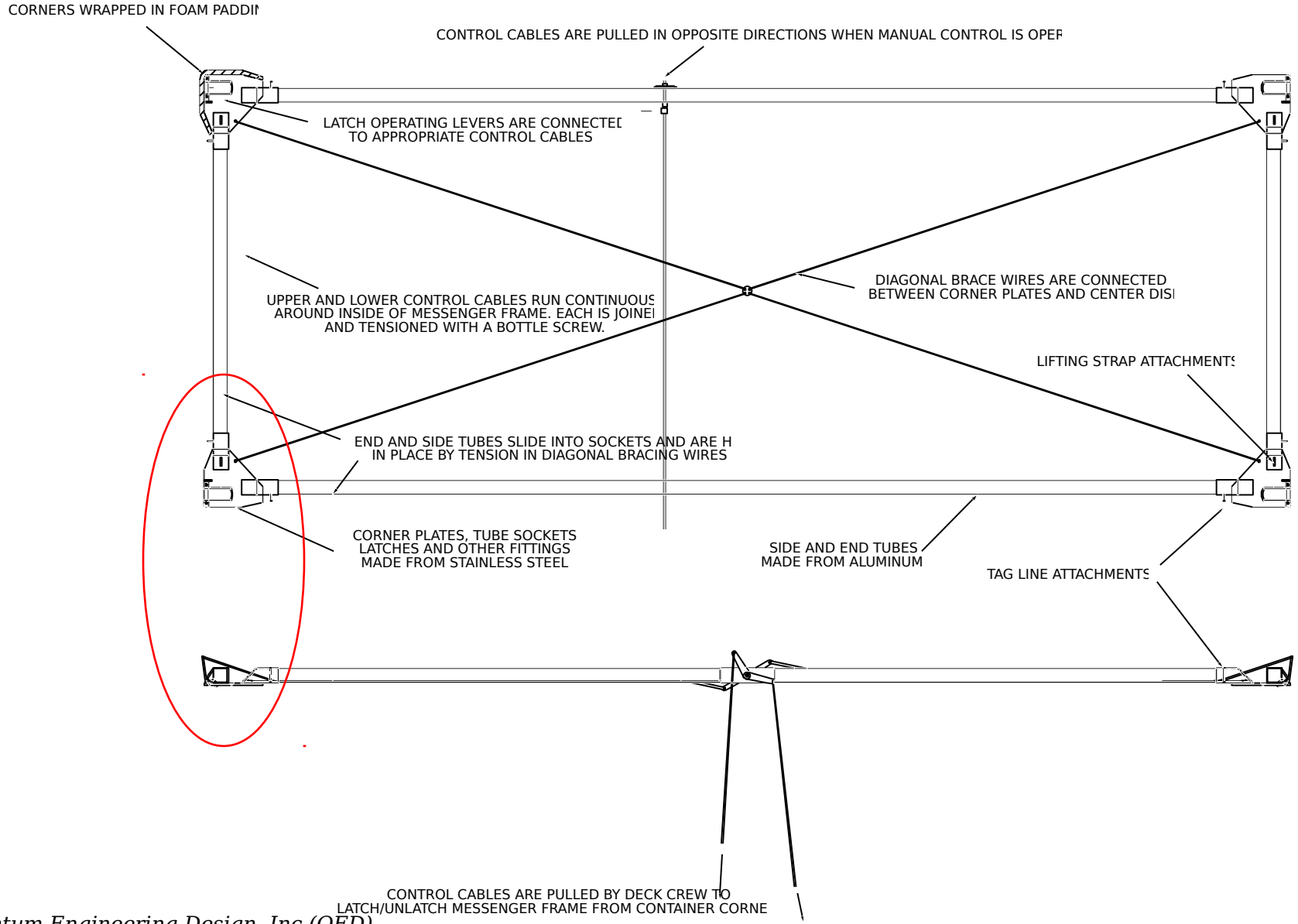
CORNERS WRAPPED IN FOAM PADDI
CONTROL CABLES ARE PULLED IN OPPOSITE DIRECTIONS WHEN MANUAL CONTROL IS OPEF
LATCH OPERATING LEVERS ARE CONNECTEI
TO APPROPRIATE CONTROL CABLES
UPPER AND LOWER CONTROL CABLES RUN CONTINUOUS
AROUND INSIDE OF MESSENGER FRAME. EACH IS JOINEI
AND TENSIONED WITH A BOTTLE SCREW.
DIAGONAL BRACE WIRES ARE CONNECTED
BETWEEN CORNER PLATES AND CENTER DISI
LIFTING STRAP ATTACHMENTS
END AND SIDE TUBES SLIDE INTO SOCKETS AND ARE H
IN PLACE BY TENSION IN DIAGONAL BRACING WIRES
CORNER PLATES, TUBE SOCKETS
LATCHES AND OTHER FITTINGS
MADE FROM STAINLESS STEEL
SIDE AND END TUBES
MADE FROM ALUMINUM
TAG LINE ATTACHMENTS
CONTROL CABLES ARE PULLED BY DECK CREW TO
LATCH/UNLATCH MESSENGER FRAME FROM CONTAINER CORNE

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TUTHILL CORP
CABLECRAFT DIVISION
MORSE CABLES
184 LTT-4-134 & 184 LTT-4-98
(100 LB PUSH, 230 LB PULL)

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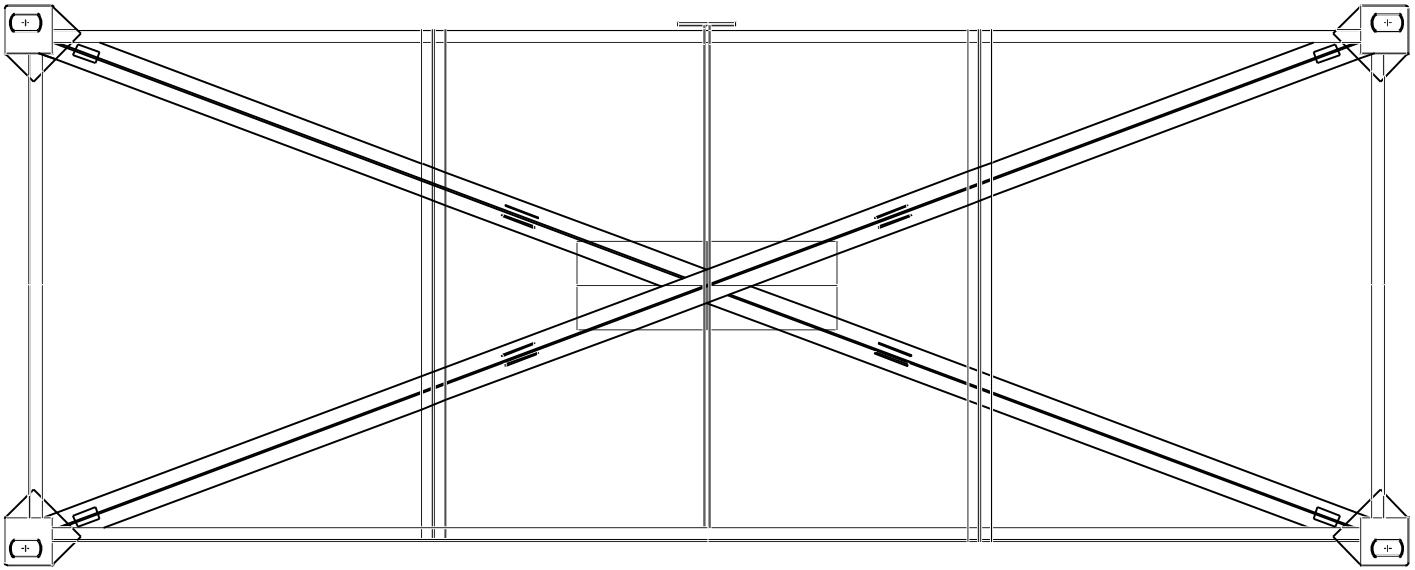

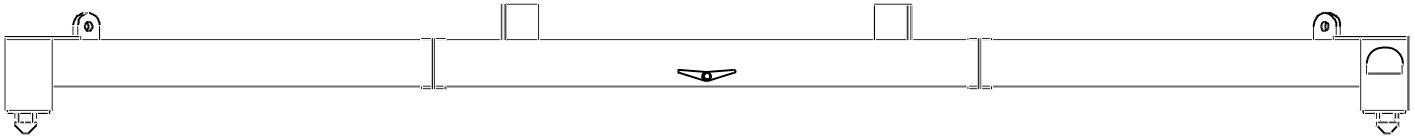

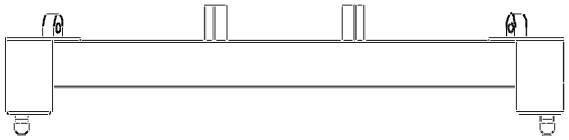

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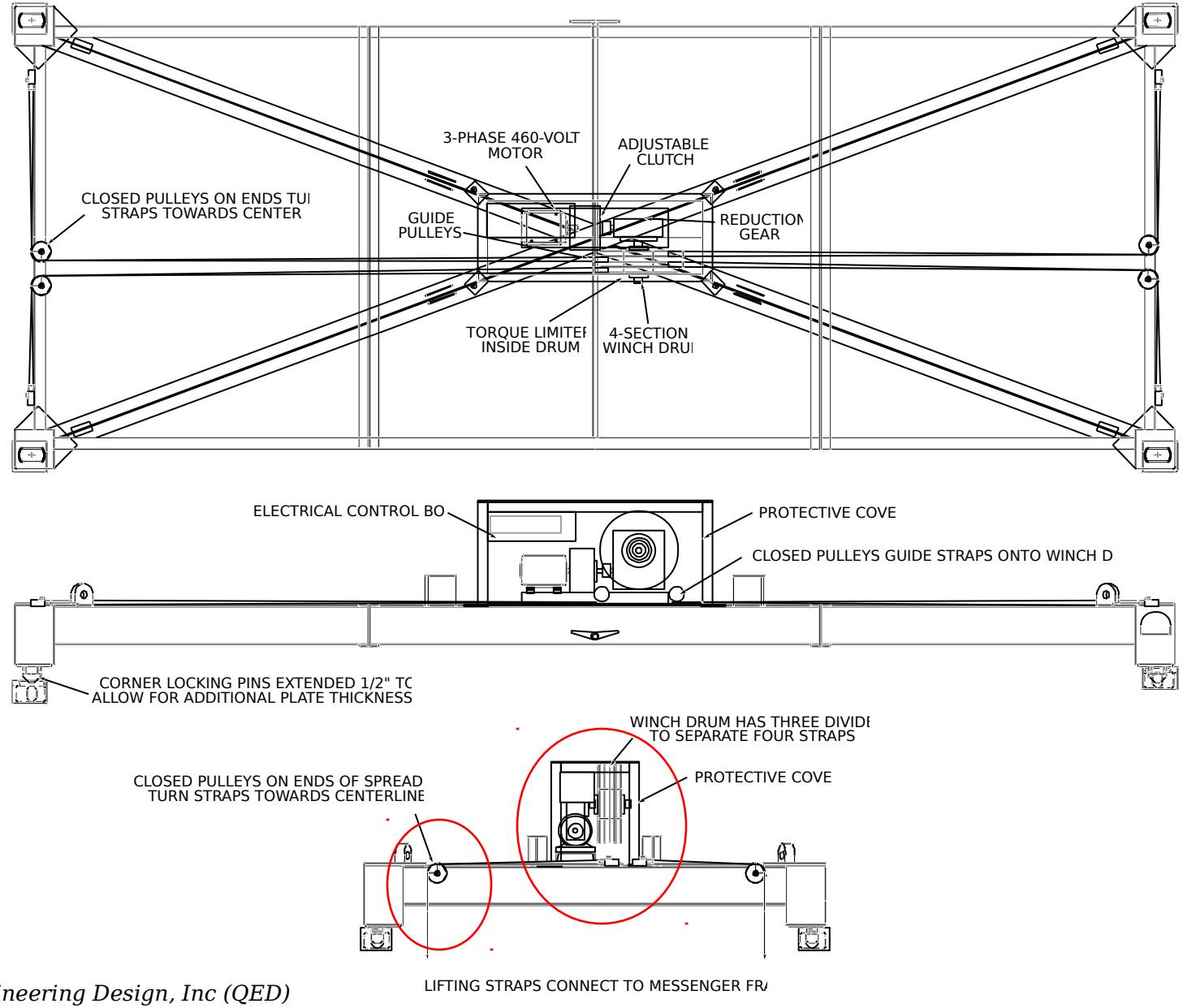
3-PHASE 460-VOLT MOTOR
ADJUSTABLE CLUTCH
CLOSED PULLEYS ON ENDS TUI STRAPS TOWARDS CENTER
GUIDE PULLEYS
REDUCTION GEAR
TORQUE LIMITEI INSIDE DRUM
4-SECTION WINCH DRUI
ELECTRICAL CONTROL BO
PROTECTIVE COVE
CLOSED PULLEYS GUIDE STRAPS ONTO WINCH D
CORNER LOCKING PINS EXTENDED 1/2" TC ALLOW FOR ADDITIONAL PLATE THICKNESS
WINCH DRUM HAS THREE DIVIDI TO SEPARATE FOUR STRAPS
CLOSED PULLEYS ON ENDS OF SPREAD TURN STRAPS TOWARDS CENTERLINE
PROTECTIVE COVE
LIFTING STRAPS CONNECT TO MESSENGER FR

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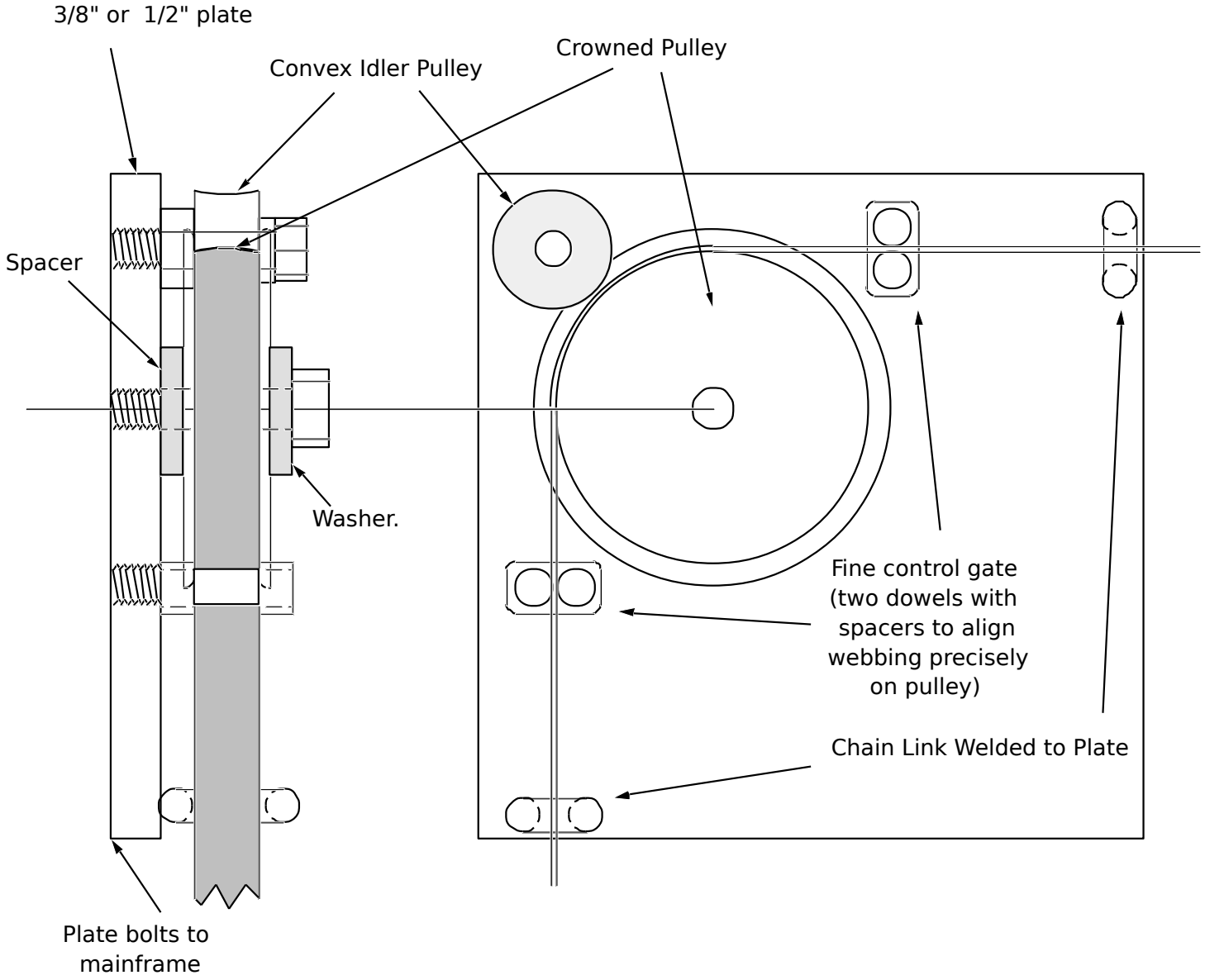

IMPROVED CONTAINER LIFTING FRAME - MARK II (ICLF-Mk II)

3-Phase, 460-Volt Mo

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ICLF Prototype Accomplishments

- Designed and fabricated Improved Container Lifting Frame and successfully demonstrated full-scale prototype aboard T-ACS Green Mountain State - Portland, Oregon 1996
- Shipped ICLF prototype to NSWC Philadelphia Naval Shipyard for independent test and evaluation under laboratory test conditions.
- Navy conducted test program using simulated moving platform with ICLF and demonstrated that it met their basic objectives.

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Proposed Statement of Work

1. Conduct engineering and prepare design information to support the fabrication of an Improved Container Lifting Frame (ICLF) based upon the prototype system developed in 1996 for the U. S. Army ref contract #DAAE07-95-R015

2. Research and acquire a commercially available mechanical actuated lifting frame capable of managing standard 20-ft ISO compatible containers. Ship to Corvallis, Oregon fabrication site for modifications.

3. Research and acquire appropriate components including all electrical and mechanical elements necessary to develop an improved version of the ICLF prototype (reference task 1 above).

4. Provide engineering support and fabricate ICLH Mk II prototype system. Conduct basic subsystem testing as necessary and prepare for preliminary test and evaluation aboard T-ACS USS Green Mountain State located in Bremerton, Washington.

5. Ship ICLF MkII prototype from Corvallis, Oregon to U.S. Naval shipyard Bremerton, WA and provide engineering support services to conduct preliminary testing aboard USS Green Mountain State. Return ICLF Mk II unit to Corvallis for any required modifications and prepare for shipping unit to U. S. Navy designated test site.

6. Provide on-site engineering support services at designated U. S. Navy east coast test site for the conduct of operational trials of the ICLF Mk II unit in conjunction with the U.S. Navy Crane anti-pendulation program.

7. Prepare a final report describing the work performed under tasks 1 through 5 above.

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